

THE GENERA OF CAPPARACEAE AND MORINGACEAE IN THE SOUTHEASTERN UNITED STATES¹

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CAPPARACEAE A. L. de Jussieu, Gen. Pl. 242. 1789, "Capparides," nom. cons.
(CAPER FAMILY)

Annual herbs or shrubs to trees, often with strongly scented or glutinous herbage. Leaves alternate [sometimes $\pm$ lacking], simple or palmately compound, usually petiolate; stipules absent (or inconspicuous) or thornlike. Hairs 1 to many celled, simple or branched, sometimes peltate, thornlike or glandular. Inflorescences few to many flowered, usually bracteate, terminal and racemose, or flowers solitary and axillary. Flowers $\pm$ irregular, hypogynous, with open or closed aestivation, bisexual (or polygamous) [to unisexual, the plants dioecious]; perianth usually 4-merous [sometimes tubular or $\pm$ perigynous basally, or very rarely undifferentiated]. Sepals usually 4 [rarely 3–8], 1 (or $\pm$ 2)-seriate, $\pm$ free or calyx lobed [or synsepalous]. Petals usually 4, free, and alternisepalous [rarely 2, $\pm$ sympetalous, or apetalous]. Receptacle usually glandular and often prolonged into an androgynophore. Stamens few [4 and alternipetalous] to many [sometimes sterile]; filaments filiform [or clavate]; anthers $\pm$ basifixed [to versatile], introrse, 2-locular at anthesis, dehiscent longitudinally; pollen usually 3-colporate and $\pm$ prolate. Gynoecium syncarpous, 2 [–8]-carpellate, usually on a gynophore; stigma $\pm$ capitate; style obsolete to long-filiform; ovary 1-(2-)[or more]-locular with 2 [or more] parietal [or rarely central] placentae; ovules few [1] to many, campylotropous, 2-integumented [sometimes with an inner layer of tracheary elements]. Fruits siliquiform [to siliculiform], dehiscent by 2 valves to indehiscent [sometimes $\pm$ baccate or inflated]. Seeds usually many [or 1], folded or $\pm$ coiled, sometimes $\pm$ arillate; endosperm scanty; embryo curved [to variously convoluted]. (Capparidaceae of authors.)

TYPE GENUS: *Capparis* L.

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Perhaps 45 genera and 450–1000 species, mostly of open, drier, tropical to temperate regions, well developed in America and Africa to altitudes of about 2000 m. About 20 genera may be monotypic; eight to twelve genera are indigenous to North America; two genera, including about ten species, occur in our area.

Eight subfamilies, four monogeneric and three of these monotypic, were recognized by Pax & Hoffman, with the bulk of the species seeming to fall into two worldwide groups. About two-thirds of the species (comprising subfam. Capparoideae, with four tribes and 25 genera) tend to be $\pm$ woody with simple leaves and $\pm$ indehiscent fruits. Nearly a third of the species (constituting subfam. Cleomoideae Pax in Engler & Prantl, largely American with perhaps 12 genera) tend to be herbaceous with palmate leaves and dehiscent fruits. The remaining six subfamilies include only eight genera and nine species, primarily of the Old World.

The alternisepalous petals, the nature of the receptacle (often variously glandular and frequently prolonged into an androgynophore and/or gynophore), and the folded or $\pm$ coiled seeds are important characteristics of the family; in many species the herbage is ill scented. Branched sclereids occur in the leaves of some taxa (Vesque), while a layer of tracheary elements is found in the seeds of some others (Orr). Idioblastic cells containing the enzyme myrosin have been identified in Capparaceae, Cruciferae, Resedaceae, Moringaceae, and Tropaeolaceae. More or less similar valvular fruits with persistent, parietal placentae are found in Papaveraceae, Fumariaceae, and Cruciferae. While perhaps closest to those of Cruciferae, the flowers of Capparaceae, sometimes with septate or plurilocular ovaries, are usually bracteate, and the stamens are not tetradynamous. The pollen of Capparaceae is commonly tricolporate and $\pm$ prolate (verified in about 18 genera), but variable in size; pollen of *Capparis cynophallophora*, about 46 μ in length, is three times that of *Cleome erosa*. The pollen of Moringaceae, Tovariaceae, and Resedaceae is $\pm$ similar, that of Papaveraceae and Cruciferae less so (Erdtman).

The nature of floral aestivation (whether open or closed) and the complete or periodic sterility of either stamens or gynoecia (perhaps more widespread than generally realized, functionally unisexual flowers having been observed in ten genera) are of interest; dioecism occurs in two or three genera. Periodicity of anthesis, whether diurnal or nocturnal, may be important in some groups. Birds (including hummingbirds) and possibly bats, in addition to many kinds of insects, are suspected pollinators.

The family is morphologically and taxonomically complex with little agreement concerning relationships, especially in regard to the sections of *Capparis* and the segregates from *Cleome*. Moringaceae Dumortier, Koeberliniaceae Engler in Engler & Prantl, and Tovariaceae Pax in Engler & Prantl, monogeneric taxa of uncertain affinities, are sometimes placed with Capparaceae. *Oceanopapaver* Guillaumin, of New Caledonia, described in Papaveraceae, probably is better included among Capparaceae.

Capparaceae are poorly known cytologically. Chromosome numbers of $2n = 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 38, 40, 70, \text{ca. } 84, \text{ca. } 85$, and

140 are reported. The unusual view of Billings that *Isomeris arborea* Nutt. ex Torr. & Gray is haplodiplont has not been substantiated (see Snow).

Capers commonly are the pickled flower buds of *Capparis spinosa*, although apparently portions of other taxa also are pickled. A few species, including *Cleome gynandra*, are eaten as potherbs and some are claimed to be medicinal or sometimes poisonous, occasionally with references to anthelmintic or insecticidal properties; a number of insect galls are known (Pax & Hoffman), however, and specimens are frequently riddled. Many species have attractive flowers, but only a few, especially of *Cleome*, are cultivated.

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KEY TO THE GENERA OF CAPPARACEAE

General characters: *herbs, shrubs, or small trees; leaves alternate, simple or palmately compound, often ill scented; flowers bisexual (or polygamous), ± hypogynous; sepals 4, 1(or 2)-seriate; petals 4, alternisepalous; receptacle often glandular; stamens few to many, often inserted on an androgynophore; ovary 1(or 2)-locular with 2 parietal placentae, often inserted on a gynophore; fruits siliquiform, dehiscent by 2 valves or ± indehiscent; seeds usually folded or coiled.*

A. Leaves simple, coriaceous; fruits ± indehiscent; shrubs or small trees of coastal Florida. 1. *Capparis*.

A. Leaves compound, 3(or more)-foliolate; fruits 2-valved and dehiscent; usually annual herbs. 2. *Cleome*.

Subfam. CAPPAROIDEAE

1. *Capparis* Linnaeus, Sp. Pl. 1: 503. 1753; Gen. Pl. ed. 5. 222. 1754.

Shrubs or small trees [sprawling or climbing], glabrous or with simple or lepidote [or stellate] hairs. Leaves simple [very rarely also 3-parted, or plants ± leafless]. Flowers few [axillary or extra-axillary; sometimes resupinate] to many, pedicellate, usually bracteate, in terminal, ± racemose [or various] inflorescences. Sepals ± free, appearing 2-seriate [rarely the outer pair connate, or calyx 4-lobed]. Petals broad [the upper pair sometimes with adjacent glandular regions]. Receptacle gland ± disclike [or membranaceous], sometimes ± lobed opposite the sepals. Stamens few to many, radiating; androgynophore very short or absent. Gynoecium on a long gynophore; stigma ± sessile; ovary 1(or 2)-locular with 2 parietal placentae [to several locular]. Fruit narrowly elongate, siliquiform [to baccate], ± indehiscent; seeds few to many, ± coiled (or irregular). LECTOTYPE SPECIES: *C. spinosa* L.; see Britton, N. Am. Trees 405. 1908. (The classical Latin name of the caper, from Greek, *kapparis*, perhaps derived from Persian, *kabar*, the caper.) — CAPER.

About 150–350 species, usually of coastal vegetation but to altitudes of 1700 m., through tropical and subtropical America, Africa, and southeastern Asia; two species occur in coastal Florida.

De Candolle divided *Capparis* into six sections (five native to the New

World), placing our two species in different sections. Pax and Hoffmann recognized fourteen sections (nine New World) and included both of our species in sect. CYNOPHALLA (with about 15–20 species distributed from Florida to South America). *Capparis cynophallophora* L., 1753 (*C. jamaicensis* Jacq.) (§ *Quadrella* DC., subg. *Quadrella* (DC.) Eichl.), Jamaica caper tree, $2n = 18$, occurring from subtropical peninsular Florida to South America, is lepidote (the scales probably equivalent to stellate hairs) on the pedicels, sepals, petals, gynoecia, and the lower surface of the leaves. The buds are quadrangular, $\pm$ acute, and the seeds are $\pm$ coiled with the hypocotyl free of the cotyledons. *Capparis flexuosa* L., 1762 (*C. cynophallophora* L., 1759) (§ *Cynophalla* DC., subg. *Cynophalla* (DC.) Eichl.), bay-leaved caper tree, occurring from Palm Beach County, Florida, southward through the Florida Keys to South America, is glabrous and with globose buds. The seeds (possibly exceptional in the family) are $\pm$ ellipsoid with the embryo $\pm$ straight, but the oblique, imbricate cotyledons enfold (and conceal) the hypocotyl. Both species (with distinctive inflorescences, buds, sepals, receptacle glands, fruits, and seeds) have conspicuously elongate fruits and were described at different times by Linnaeus as *C. cynophallophora* (see Fawcett & Rendle); later authors sometimes have mistakenly reversed the names. The sections to which our species should be referred cannot be determined without a revisionary study of the genus.

The fruits of *Capparis* are either globular, with two to several placentae (sometimes plurilocular), or elongate and siliquiform, with only two placentae (and one- or two-locular). A conspicuous septum is formed in the two-locular ovaries of *C. flexuosa*, but in *C. cynophallophora* the septum is absent, inconspicuous, or possibly discontinuous. In "*C. horrida*," the fruits are unilocular when young but four-locular when older; in "*C. galeata*," the eight septa are free or united centrally (Rao). The initially one-locular fruits of *Crateva* L., a related genus, are divided by a double-layered proliferation from the placentae until the time of fertilization, but as the ovules mature and the ovary increases in size, this septum is ruptured (Raghavan & Venkatasubban, 1940a, b). The median carpellary bundles of the multilocular fruits of *C. spinosa* are absent (Eggers), suggesting that multiplacental fruits of *Capparis*, as in some Papaveraceae, are possibly more specialized than two-placental fruits which have well-developed median carpellary veins.

On the basis of wood anatomy, Cristiani placed *Capparis* at the end of the series *Cleome*, *Crateva*, *Atamisquea*. De Wolf, in agreement with a brief comment by White, makes the interesting suggestion that American species of *Capparis* are not congeneric with the lectotype species, *C. spinosa*, $2n = 38$, ca. 84, a straggling shrub of the Old World with resupinate flowers. Little is recorded concerning floral biology, but in Israel, flowers of *C. spinosa* open in the early evening and wither by the next afternoon; many flowers have rudimentary ovaries; when ripe, the fruits burst open.

Juvenile leaves and sterile twigs are sometimes different from flowering branches and should be noted by collectors.

Chromosome numbers have been reported for only a few species: $2n = 18, 30, 32, 38, 40, \text{ca. } 84, \text{ca. } 85$. Chromosome counts of our two species, determined from our area, would be desirable.

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Under family references see DE WOLF, EGGERS, EICHLER, JACOBS, ORR, PAYER, RAGHAVEN & VENKATASUBBAN (1940a, b).

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Subfam. CLEOMOIDEAE Pax in Engler & Prantl

2. **Cleome** Linnaeus, Sp. Pl. **2**: 671. 1753; Gen. Pl. ed. 5. 302. 1754.

Annual [to perennial] herbs, often pubescent, glandular, and ill scented, sometimes thorny. Leaves palmately compound [or simple]. Flowers in terminal inflorescences (or axillary); aestivation closed or open. Sepals $\pm$ free, 1-seriate, sometimes imbricate in the buds. Petals usually clawed, sometimes dissected. Stamens 6 [or 4] to many, often inserted on an androgynophore. Receptacle gland various. Style distinct or indistinct; ovary 1-locular with 2 placentae, usually on a gynophore; flowers bisexual, sometimes $\varnothing$ -sterile or polygamous. Fruit usually siliquiform [to siliculiform], 2-valved, sometimes $\pm$ sessile; dehiscence $\pm$ acropetal and usually complete or basipetal (or lateral) and often incomplete.

Seeds few to many, $\pm$ folded and orbicular to $\pm$ coiled, sometimes $\pm$ arillate. (*Gynandropsis* DC., *Neocleome* Small, *Peritoma* DC., *Physostemon* Mart. & Zucc., *Atalanta* Nutt., *Polanisia* Raf., *Aldenella* Greene, *Cristatella* Nutt.); LECTOTYPE SPECIES:² *C. ornithopodioides* L.; see Hitchcock & Greene, in Int. Bot. Congr. Cambridge 1930. Nomencl. Propos. Brit. Bot. 172. 1929. (Latin name of some mustard-like plant; applied by Linnaeus to this genus, which Tournefort called *Sinapistrum*; perhaps derived from Greek, *kleio*, to shut up or inclose.)

Perhaps 200 species, mostly of open or disturbed habitats through the tropics and subtropics, a few of cooler areas, concentrated in America and Africa. About three to five species are indigenous to our area and about six are introduced.

Section GYNANDROPSIS (DC.) R. Br. (including § *Gymnogonia* R. Br.; subg. *Gynandropsis* (DC.) Schultes & Schultes), tending to have the receptacle prolonged into an androgynophore, the style often short and thick, the valves of the fruits inconspicuously veined and without prominent median vein, and the dehiscence of the valves $\pm$ acropetal and usually complete, is represented with us by at least three species. *Cleome gynandra* L. (*Gynandropsis gynandra* (L.) Briq.), $2n = 30, 32, 34$, with prominent androgynophore, a pantropic weed probably of Old World origin, is reported in the Coastal Plain of our area and in Bermuda; *C. spinosa* Jacq. (*Neocleome spinosa* (Jacq.) Small) (§ *Pedicellaria* DC., § *Herbaceae* Pax in Engler & Prantl, § *Eucleome* O. Kuntze in Post & Kuntze), spider-flower, $2n = 20, 24, 38, 70, 140$, pubescent and with thornlike stipules and epidermal outgrowths, neotropical in origin, has been collected in each state of our area with the apparent exception of Alabama; *C. speciosa* HBK.³ (*Gynandropsis speciosa* (HBK.) DC., *G. Tracyi* Briq.), closely resembling *C. spinosa* but glabrate and without thorns, may occur as an escape from cultivation. *Cleome serrata* Jacq. (*Neocleome serrata* (Jacq.) Small), native to the West Indies but reported from Georgia by Small, may belong to this section. The flowers of *C. gynandra*, *C. speciosa*, and *C.*

² Robert Brown (1826, p. 222), critical of the generic status of *Gynandropsis* segregated by De Candolle from Linnaean species of *Cleome*, remarked that *C. pentaphylla* L. [= *C. gynandra* L., *Gynandropsis gynandra* (L.) Briq.] was the earliest known species of *Cleome* and the one on which the genus was chiefly constituted; this could be looked upon as designation by Brown of the lectotype species of *Cleome*. The same taxon was chosen as lectotype by Britton & Brown (Illus. Fl. No. U. S. ed. 2. 2: 196. 1913). Hitchcock & Green agreed that *C. gynandra* is undoubtedly the type species of *Cleome* but selected *C. ornithopodioides* as a new lectotype because *C. gynandra* is regarded as the type of the genus *Gynandropsis*, now conserved; previously, however, the lectotype species of *Gynandropsis* had not been designated. In this instance, the complications of the taxonomic framework of *Cleome* were compounded by the selection of a substitute generic lectotype.

³ The correct name for this taxon, which may be only a smooth form of *Cleome spinosa*, is uncertain. The description of *C. speciosa* Raf., 1817, based on a plant, possibly of Mexican origin, in cultivation in Louisiana, is inadequate and was doubtless based upon a different holotype than *C. speciosa* HBK., 1821, described from Colombian material.

spinosa open in the evening. All of the above species are more frequent south of our area.

Section POLANISIA (Raf.) Baill. (*Polanisia* Raf., *Polanisia* § *Eupolanisia* Endl., *Cleome* subg. *Polanisia* (Raf.) Schultes & Schultes; including *Cristatella* Nutt., *Aldenella* Greene), without prominent androgynophore, with the gland of the receptacle usually adaxial and $\pm$ columnar, the style narrow and elongate, the ovary often broad, the valves of the fruits coarsely veined and usually with a distinct but incomplete median vein, and the dehiscence of the valves basipetal and usually incomplete, is represented with us by at least four species. The styles often are filiform, fragile in fruit, and frequently missing from herbarium specimens, but are neither articulated nor deciduous. *Cleome graveolens* (Raf.) Schultes & Schultes (*Polanisia* [§ *Brachystyla* DC.] *graveolens* Raf.; *P. dodecandra* (L.) DC. sensu Iltis, not *Cleome dodecandra* L.), clammyweed, with relatively broad leaflets, occurs from Mexico to Canada but is collected infrequently in our area. Iltis (1958) included in this species both *C. trachysperma* (Torr. & Gray) Pax & Hoffmann (*Polanisia trachysperma* Torr. & Gray, *P. dodecandra* subsp. *dodecandra* var. *trachysperma* (Torr. & Gray) Iltis), and *C. uniglandulosa* Cav. (*P. dodecandra* subsp. *uniglandulosa* (Cav.) Iltis) (*Polanisia* § *Stylaria* DC.), the latter with styles to 4 cm. long, occurring to the west and south of our area.⁴ This complex of taxa is seen by Iltis as a morphological continuum which tends to diminish in flower size from south to north. *Cleome Aldenella* W. R. Ernst⁵ (*Polanisia* § *Aldenella* (Greene) Iltis), with linear leaflets and fruits, occurs in the coastal plain of Georgia, Florida, and Mississippi. *Cleome erosa* (Nutt.) Eaton (*Cristatella erosa* Nutt., *Polanisia erosa* (Nutt.) Iltis subsp. *erosa*) (*Cleome* § *Cristatella* (Nutt.) Baill., *Polanisia* § *Cristatella* (Nutt.) Iltis), with linear leaflets and distinctive, broad, laciniate petals, primarily of Texas, is reported from central Louisiana. The closely related taxa treated as *Polanisia erosa* (Nutt.) Iltis subsp. *breviglandulosa* Iltis and *P. Jamesii* (Torr. & Gray) Iltis (*Cristatella Jamesii* Torr. & Gray) occur west of our area; combinations in *Cleome* are not available for these two taxa. *Cleome viscosa* L. (*Polanisia viscosa* (L.) DC.) (*Polanisia* § *Brachystyla* DC., § *Ranmanissa* Endl.), $2n = 20$, a pantropic weed of Old World origin, with broad leaflets, eight to many stamens (sometimes with clavate filaments), androgynophore and gynophore essentially absent, is introduced in Pinellas County, Florida, in Bermuda, and south of our area. *Cleome rutidosperma* DC. (*C. ciliata* Schum. & Thonn. [see Iltis, 1960]) (*Cleome* § *Siliquaria* (Forsk.) DC., § *Herbaceae* Pax in Engler & Prantl, § *Rutidosperma* Iltis), with $\pm$ indeterminate growth, axillary flowers, and dehiscence of the valves $\pm$ lateral and incomplete, is an Old World species introduced in Orange and Palm

⁴ Nomenclatural combinations have not been made for *Cleome trachysperma* and *C. uniglandulosa* as infraspecific taxa of *C. graveolens*.

⁵ *Cleome Aldenella*, nom. nov., based on *Polanisia tenuifolia* Torr. & Gray, Fl. N. Am. 1: 123. 1833 (*Aldenella tenuifolia* (Torr. & Gray) Greene, Pittonia 4: 212. 1900); not *Cleome tenuifolia* (Mart. & Zucc.) Iltis, Brittonia 11: 161. 1959.

Beach counties, Florida, and south of our area; it is somewhat similar to *C. aculeata* L. (also introduced into the New World) and in some respects resembles members of sect. POLANISIA. *Cleome diffusa* Banks ex DC. (*C. aculeata* var. *diffusa* (DC.) O. Ktze.), of tropical America, was collected by Mohr on ballast at Mobile, Alabama, in 1893 (Iltis).

The taxonomy of *Cleome* is unsettled, with radical disagreement as to the composition of sections and of segregate genera. Of particular concern in our area is the status of sect. POLANISIA. De Candolle separated the Old World taxa of *Cleome* with more than six stamens as the genus POLANISIA, thus including among them *C. viscosa*; *C. gynandra*, having six stamens but with a conspicuous androgynophore and gynophore, was placed in the genus *Gynandropsis*. While taking a broad view of the *Cleome* complex, Pax & Hoffmann reduced *Polanisia* to *Cleome* but separated *Isomeris*, *Gynandropsis*, *Cristatella*, and *Physostemon* (see also Pax, 1891). In contrast, Iltis would reduce *Isomeris*, *Gynandropsis*, and *Physostemon* to *Cleome* but would separate *Polanisia*, restricting the last to North American species and including *Cristatella*. (See Iltis, 1957, for presumed relationships of *Cleome*, *Cleomella*, *Wislizenia*, and *Oxystylis*).

Iltis emphasizes that the indigenous North American species of sect. POLANISIA are highly specialized and that their closest affinities are with Old World species of *Cleome*, rather than with other New World species. Our species of sect. POLANISIA recall in some respects, however, *Cleome* § PHYSOSTEMON (Mart. & Zucc.) Benth. & Hook., of the New World, as well as *C. arabica* L. and *C. ornithopodioides* L., both of sect. CLEOME (§ *Herbaceae* Pax in Engler & Prantl, § *Eucleome* O. Kuntze in Post & Kuntze), of the Old World. A logical means of separating at the sectional level the indigenous North American species of sect. POLANISIA from *Cleome viscosa*, on the one hand, and from *C. ornithopodioides*, on the other hand, is not readily apparent. Recognition of *Polanisia* as a genus and its restriction to indigenous North American species rests heavily on the nature of the petal margins, the nature of the apex of the receptacular gland, and, in large measure, on the identity of the lectotype species.⁶

⁶ In presenting *Polanisia* as a new genus, Rafinesque (Am. Jour. Sci. 1: 378. 1819) described *P. graveolens* but stated that the "type" of his genus was *Cleome dodecandra* L.; he also stated that his species was the same one that Michaux and Pursh called *C. dodecandra*. The meaning of the word "type" is debatable. I am assuming, in this instance, that "type" was not used in the strict, modern, nomenclatural sense, but to indicate an abstract, morphological relationship; therefore, I am taking *P. graveolens* as the type species of *Polanisia*.

Iltis (1954, *et seq.*) concluded that *Cleome dodecandra* L. was the same taxon as our indigenous *Polanisia graveolens*, and he adopted for our plant the combination *P. dodecandra* (L.) DC., which De Candolle, however, maintained as distinct from *P. graveolens*. By way of a poor photograph, Iltis selected as lectotype for *C. dodecandra* L., an immature specimen in the Linnaean herbarium bearing a tag on the plant with "HU. 12andr." [*Hortus Upsaliensis, dodecandra*] but with Linnaeus' annotation "viscosa" on the sheet. Iltis' interpretation that this plant was grown at Upsala from seeds gathered in North America and that this specimen represents the same taxon described by Rafinesque as *P. graveolens* may be correct; however, the lectotype for *C. dodecandra* should be selected from the Hermann herbarium, not from the Linnaean.

For insight into the confusion surrounding the interpretation of *Polanisia* Raf., see Britton, Greene, House, and Iltis.

Polygamous or ♀-sterile flowers and the consequent intermittent production of fruits are conspicuous in the inflorescences of several species, among them *Cleome spinosa* and *C. gynandra*; as many as 50 per cent of the flowers on some plants of *C. rutidosperma* are ♀-sterile (Johnson & Seng). Woodson recommends retaining *C. gynandra*, which he considers hermaphrodite, in *Cleome* and transferring the monoecious species of *Gynandropsis* to *Podandroyne* Ducke, of South and Central America. Sexuality in the Cleomoideae appears variable and requires further investigation. The tendency for an androgynophore and/or gynophore is characteristic of the family, but these structures seem to be unreliably variable in length, becoming conspicuous, in many instances, only with the maturation of the fruits.

The cytological information is fragmentary and usually poorly documented. Chromosome numbers of $2n = 18, 20, 22, 24, 30, 32, 34, 38, 70$, and 140 are reported. Documented chromosome counts for the species in our area would be welcome.

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Linnaeus did not indicate clearly in *Species Plantarum* (p. 672. 1753) which taxon he intended to name *Cleome dodecandra*, for which he gave the habitat as “in Indiis.” The primary reference, to his original description in *Flora Zeylanica* (p. 109, species 242. 1742), is marked by an asterisk, indicating it as a good description. The other references include a plate (“*Burm. zeyl.* 212. *t.* 11. *f.* 1”) possibly referable to *C. rutidosperma* DC., and a plate (“*Sloan. jam.* 80. *hist.* 1. *p.* 194. *t.* 124. *f.* 1”) probably of *C. serrata* Jacq. As shown by Iltis (1954), the name *Cleome dodecandra* L. ultimately must rest upon Linnaeus’ own description in *Flora Zeylanica*. The name, however, should be typified in Hermann’s Ceylon herbarium, the basis of the descriptions in *Flora Zeylanica*, and not in the Linnaean herbarium. According to Trimen (*Jour. Linn. Soc.* **24**: 129–155. 1888), the Hermann herbarium, now in the British Museum (Natural History), consists of four volumes of plants and one volume of drawings, collected or drawn in Ceylon but including also some American plants cultivated in Ceylon and some plants collected in Africa. In Trimen’s list equating the species of *Flora Zeylanica* with the Hermann materials (p. 146), the item corresponding to species 242 (the polynomial and description upon which *Cleome dodecandra* is based) is a drawing which Trimen identified as “*C. viscosa* L., var.” This drawing should be taken as the type of *C. dodecandra* L. The equation of the American *Polanisia graveolens* Raf. with the Asiatic *Cleome dodecandra* L. appears erroneous.

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MORINGACEAE Dumortier, Anal. Fam. 43, 48. 1829, nom. cons.

(HORSE-RADISH TREE FAMILY)

A family of a single genus characterized by alternate, pinnatifid, deciduous leaves; clustered, weakly perigynous flowers with 10 perianth segments and 10 stamens; 3-carpellate gynoecia; and elongate, woody, 3-valved fruits with the seeds (usually winged) attached medially to the valves.

1. *Moringa* Adanson, Fam. Pl. **2**: 318. 1763.

Trees to about 10 m. tall with spreading branches, usually with thick trunk and gummy bark. Hairs 1-celled. Leaves deciduous, alternate, exstipulate (or stipules small and stipitate, at the base of the petioles and petiolules), 2(or 3)-odd-pinnate with many opposite leaflets. Flowers many, in axillary panicles or panicles of cymes, irregular, bisexual, weakly perigynous. Perianth 5-merous, 2-seriate; sepals and petals $\pm$ similar, spreading to reflexed, white, pink [or red]. Stamens 10, $\pm$ unequal, the antisepalous ones $\pm$ staminodial; filaments swollen toward the base, sometimes variously connivent; anthers dorsifixed, 1-locular at anthesis, longitudinally dehiscent; pollen 3(4)-colporate. Gynoecium 3(rarely 2 or 4)-

carpellate, on a short gynophore; stigma inconspicuous; style slender; ovary 1-locular with 3 parietal placentae; ovules numerous, in 2 vertical series on the placentae, anatropous, 2-integumented, the micropyle directed upward with the funiculus beneath (i.e., apotropous). Fruits pendent, linear, 3-valved and $\pm$ 3-sided; dehiscence explosive, basipetal and complete; seeds many, usually conspicuously 3-winged [or wings absent], attached medially to the woody valves; embryo straight; endosperm lacking. Seedling cotyledons hypogeous, retained within the seed coat [or epigeous]. TYPE SPECIES: *Guilandina Moringa* L. = *Moringa oleifera* Lam. (Name derived from the native Malabar name.)

Perhaps ten species distributed in drier regions from Africa and Madagascar to the East Indies. Two sections have been recognized on the basis of the shape of the receptacle: tubular in the monotypic sect. *DYSMORINGA* Engler and cup shaped in sect. *MORINGA* (§ *Eumoringa* Engler), represented with us by *Moringa oleifera* (*M. pterygosperma* Gaertn., *M. Moringa* (L.) Millsp.), horse-radish tree or drumstick tree, $2n = 28$, planted throughout the warmer portions of the world, including the Bahama Islands and subtropical Florida where it is possibly naturalized. Modern distribution records in our area are needed.

Described by Linnaeus as a legume, *Moringa* has been placed with various groups, among them Capparaceae, with which it shares the gynophore and uniseriate, alternisepalous corolla. Cells containing myrosin have been identified in Moringaceae, Cruciferae, Capparaceae, Resedaceae, and Tropaeolaceae. *Moringa* probably has no very close allies.

The distinctive fruits, unique in the Rhoeadales, are completely dehiscent but lack the persistent replum characteristic of the dehiscent fruits of Papaveraceae, Fumariaceae, Cruciferae, and Capparaceae; instead, the seeds are attached medially to the valves. Puri advanced the opinion, somewhat paralleling the account by Eames & Wilson of the cruciferous gynoeceum, that the placentation was extracarpellary, the result of solidification of the carpels with the coincidental extrusion of the ovules into a central locus. It is not certain how the Gonophyll Theory (Melville) would explain this situation. Under the simpler, classical view, the valves of *Moringa* separate at the carpellary midrib.

Up to 20 per cent of the seeds of *Moringa oleifera* in India are without an embryo, and some embryos have an extra cotyledon (Puri, 1941).

The leaves, young fruits, and roots of *Moringa oleifera*, said to have the flavor of horse-radish, are eaten in India. Various medicinal properties are claimed, and oil from the seeds, ben (or bene) oil, is sometimes used as a mechanical lubricant and in cosmetics.

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